

ABSTRACT

Title of Thesis:

THE ROLE OF URBAN AGRICULTURE IN
BALTIMORE FOOD SYSTEMS

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The United States is one of the most agriculturally productive countries; and yet, food insecurity remains a significant issue. Urban agriculture in Baltimore, Maryland should be studied further because of its potential to address food insecurity while overcoming systemic barriers created and embedded within food systems. While numerous previous studies have explored food insecurity, knowledge gaps still exist regarding how urban agriculture has influenced food accessibility, and how availability, cultural values of foods, etc. can be improved through increased production and distribution practices of fresher fruits and vegetables in Healthy Food Priority Areas. To address these knowledge gaps, we queried food insecure community members and urban farmers in Baltimore, Maryland to better understand the underlying factors that influence low fruit and vegetable consumption and how they can be mitigated through the establishment of urban agriculture. Urban farmers were interviewed in detail about their

production and distribution patterns, and factors influencing the low consumption of fresh fruits and vegetables by community members in Baltimore. Food insecure individuals were asked about their food consumption habits and the accessibility of fruit and vegetables, their food purchasing behavior and related challenges, and community needs. Results indicate that while accessibility and availability are two main factors in fresh produce consumption, there are other important factors that might have received limited attention in existing literature. Our interviews revealed that income, cultural value, and a lack of knowledge in food preparation are key factors in low consumption and purchase of fresh fruits and vegetables. To address the underlying factors and improve the accessibility and availability of fresh produce to low-income communities, it is important to assess community needs and provide policy recommendations that can potentially enhance their nutrition. Ensuring access to individuals with limited resources is a critical component of advancing social justice.

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by

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Table of Contents

Table of Contents	ii
List of Tables	iii
List of Figures	iv
Chapter 1: Introduction to Food Insecurity Challenges in Baltimore	1
Growing Agricultural Productivity and Food Insecurity Paradox	1
What is Urban Agriculture?	3
Knowledge Gaps.....	4
Food Insecurity Challenges in Baltimore	5
Urban farms in Baltimore	9
Chapter 2: Urban Agriculture as an Approach to Address Food Insecurity	11
Introduction	11
Methods.....	12
Data Collection.....	12
Recruitment.....	12
Interview Protocol	13
Data Analysis	14
Results	15
Factors leading to low consumption of fruits and vegetables.....	15
Impact of Urban Agriculture	19
Improving Accessibility and Availability	22
Discussion	23
Limitations.....	26
Policy Implications.....	27
Conclusions and Future Directions.....	30
Appendices	32
Appendix A.....	32
Appendix B.....	35
Bibliography	36

List of Tables

Table 1: Coding scheme from community interviews and frequency.

Table 2: Factors leading to low consumption of fruits and vegetables according to community members.

Table 3: Factors leading to low consumption of fruits and vegetables for community members—perspectives of urban farmers.

List of Figures

Figure 1: The spatial distribution of Healthy Food Priority Areas relative to the African American population in Baltimore, MD.

Figure 2: Map of urban farms relative to low-income population in Baltimore, MD.

Chapter 1: Introduction to Food Insecurity Challenges in Baltimore

Growing Agricultural Productivity and Food Insecurity Paradox

The United States is one of the most productive agricultural regions in the world (Wang et al., 2024), yet food insecurity remains a pressing issue in many parts of the country. Since 1948, agricultural productivity in the US has tripled, growing at an annual rate of 1.46% (USDAA, 2024). Food and agriculture related industries contributed nearly \$1.420 trillion to the United States gross domestic product (GDP) in 2022, which is about a 5.5% share (USDAB, 2023). Similarly, the United States' farm output contributed about \$223.5 billion of this total, accounting for roughly 0.9% of the United States' GDP (USDAB, 2023). According to the USDA, the United States is producing enough produce to meet the national population's basic nutrition requirements (USDAA, 2024).

However, food security, defined as *access by all people at all times to enough food for an active, healthy life* (USDAB, 2024), remains a pervasive issue faced by many Americans, especially those of low-income backgrounds (Coleman-Jensen et al., 2021). According to the USDA, 12.8% of Americans were food insecure at one point during 2022, which was higher than the food insecurity rate of 10.2% in 2021 (USDAB, 2023) About 13.5 million households across the country are living in food insecure areas, which are now known as Healthy Food Priority Areas (Coleman-Jensen et al., 2021). According to the Johns Hopkins Center for a Livable Future, the term “food desert” sparks negative connotations and provides implications of low healthy food access being a naturally occurring phenomenon. However, after it was determined that it is instead a result of structural inequalities, the terminology was changed in the Baltimore City's Food Environment 2018 report from “food desert” to “Healthy Food Priority Area” (Misiaszek et

al., 2018). These areas are constituted by the following parameters: 1) an area where the distance to a supermarket or supermarket alternative is over ¼ mile, 2) the median household income is at or below 185% of the Federal Poverty Level, 3) more than 30% of households have no vehicle available, and 4) the average Healthy Food Availability Index (HFAI) score for all food stores is low (Baltimore Hunger Project, 2020). Such dilemma of high productivity and persistent food insecurity indicate gaps in distribution and accessibility in the current agricultural food system (USDAC, 2024).

To tackle food insecurity in the US, there have been increasing efforts by food assistance programs and school lunch policymakers, yet the percentage of U.S. households experiencing food insecurity has not improved in the last twenty years (Coleman-Jensen et al. 2022), highlighting that the current resources and policies are inadequate. Ongoing efforts to address food insecurity include emergency food assistance programs, mobile food markets, and partnership and collaborations. While food assistance distribution centers play a crucial role in providing immediate relief to individuals and families in need, they often operate on limited resources and may struggle to meet long-term nutritional needs for their clientele. Relying solely on emergency food assistance programs without addressing the underlying causes of food insecurity may not be adequate in achieving sustainable solutions. In contrast, mobile food markets can increase access to fresh produce in Healthy Food Priority Areas, but there are often logistical costs involved, like transportation costs, limited operating hours, and seasonal availability of produce. In addition, neither program is likely to address direct systemic issues, such as income inequality and lack of affordable housing that can also contribute to food insecurity. Partnerships and collaborations between diverse stakeholders are critical in addressing food insecurity comprehensively, but challenges like coordination, funding

opportunities, and differing agendas amongst partners can impact the effectiveness of collaborative efforts. To combat the issue of food insecurity, ensuring that partnerships are equitable, transparent, and focused on community needs is crucial for its ultimate success (Rother, 2022).

While rural food insecurity is of major concern and more prevalent in the United States, urban food insecurity is the focus of this study as there are disproportionate impacts among urban residents (Vilar-Compte et al., 2021). Urban areas tend to present great economic and social development but can also contain greater concentrated poverty.

Here, the urban poor are faced with limited access to income and resources, basic resources, and labor opportunities. The Sustainable Development Goals (SDGs) are strongly linked with food insecurity, with Goal 2 aiming to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture (United Nations, 2023). In urban settings, there is a higher risk for food insecurity and poor nutrition outcomes because food accessibility depends on commercial supply, which is also linked to income (Vilar-Compte et al., 2021). Studies suggest that on average, urban diets are better than those in rural settings because of increased diversity and access to animal proteins. However, this is not always the case, and this “urban advantage” is not equally distributed and does not extend to the poorest of socioeconomic cities (Vilar-Compte et al., 2021; Burger et al., 2020).

What is Urban Agriculture?

In the past decade, urban agriculture has emerged as a key sustainable practice that can potentially help to enhance food security in urban areas. Urban agriculture refers to growing fruits, vegetables, herbs, and raising livestock and animals in urban settings, which can also

include community gardening (Puget Sound Regional Council, 2013). In contrast to community gardens, urban farms generally operate on a large scale and are for profit establishments (Puget Sound Regional Council, 2013).

Many studies highlight the advantages of urban agriculture, such as contributing to urban greening, beautification, and nutrition enhancement, alongside improving public and mental health, and fortifying community food security (Siegener et al., 2018). Additionally, urban agriculture offers environmental benefits, such as reducing urban heat island effect, improving local air quality, and mitigating climate change (Siegener et al., 2018). Urban agriculture is a flourishing food movement that is oriented towards improving food accessibility, particularly in low-income communities in urban settings (Siegener et al. 2018; Lovell, 2010). However, to reduce risks of unintended consequences like severe health issues or further injustices on vulnerable communities, it is crucial that we understand the links between urban agriculture and food security.

Knowledge Gaps

Despite extensive research on food insecurity in various regions, from California to New York City (Diekmann, 2020; David, 2017; van Dijk & Meijerink, 2014), significant gaps remain in our understanding of the root causes of the lack of food access and availability in urban areas, barriers for ensuring fulfillment of nutritional requirements, and the potential role of urban farming in addressing these challenges. Urban farming has potential to enhance food availability and distribution methods in urban areas, thereby aiding food-insecure populations. Community Supported Agriculture (CSAs) are a method that some urban farmers have utilized to support low-income families by offering shares of produce in advance, either on a weekly or monthly

basis. However, the specific impact of urban agriculture on food insecurity is not well-documented, indicating a pressing need for detailed studies to delineate the precise actions necessary for tackling food security challenges. Farooq et al. (2022) emphasize the urgency for further research that could elucidate the production and distribution practices targeting low-income communities, where such insights are scarce.

Food insecurity in urban areas is a multifaceted problem, requiring comprehensive research to assess the impact of a range of drivers and to inform effective intervention strategies.

Preliminary research suggests that poorer urban neighborhoods have less access and inconsistent availability to healthy foods, leading to a range of adverse effects on environmental, social, physical, and mental wellbeing of these communities (Meenar & Hoover, 2012). Furthermore, as regions become more urbanized, communities become dissociated as a result of racially motivated spatial inequalities (Meenar & Hoover, 2012). While accessibility and availability are two critical drivers, other factors such as time, transportation, and systemic inequality issues like unemployment also contribute to the prevalence of food insecurity (Sharkey, 2011; Nord et al., 2007). This complexity highlights the urgent need for holistic research that examines these interrelated factors, with the goal of developing targeted, effective solutions to address the persistent problem of food insecurity.

Food Insecurity Challenges in Baltimore

Baltimore is a unique case for studying the barriers related to addressing food insecurity due to its historical landscape and pressing challenges. Baltimore City, located in north-central Maryland, 40 miles northeast of Washington D.C., lies at the head of the Patapsco River estuary. It is the largest city in Maryland, with a population of 585,708 people (United States Census

Bureau, 2022). While Baltimore also has the largest urban population in Maryland, many communities are not receiving adequate access to fresh produce. The city has been affected by historical policies that are related to structural racism and many policies have led to inequitable access to resources like “healthy food” (Scott, 2022; Bilal, 2016; Misiaszek et al., 2018), resulting in a food insecurity rate of 18% in 2019. The COVID-19 pandemic further exacerbates the food insecurity problem in the city, increasing the food insecurity rate to rise to 21.7% in 2021 (City of Baltimore, 2021). For over twenty years, Baltimore communities have faced inadequate access to nutritious food, which influences quality of life and development through reduced risk of chronic diseases and body weight management (Pem & Jeewon, 2015).

The consumption of healthy food is inadequate in Baltimore, especially for fresh fruits and vegetables. In a 2015 study conducted by the JHU CLF, Baltimore residents were not consuming the recommended five daily servings of fruits and vegetables (Santo et al., 2015). Adults in Baltimore reported consuming less than 18% and 14% of recommended amounts of fruits and vegetables, respectively. Furthermore, a study in 2009 showed that low-income residents consumed only 55% of the daily recommended amount (DOA), which consisted of 0.96 cups of fruits and 1.43 cups of vegetables, when the recommended amount was the equivalent to 1.03 cups of fruits and 2.60 cups of vegetables (Dong & Lin, 2009). Since fruits and vegetables are an essential component of healthy diet and can support a healthy immune system that aids in preventing obesity, type 2 diabetes, cardiovascular diseases, and other severe illnesses (Lee et al., 2022), it is critical to identify ways that accessibility of fresh fruits and vegetables can be improved for low income and food insecure communities, which is the focus of this study.

The lack of fruit and vegetable consumption is also a typical healthy food issue for Maryland and the United States. On a national scale, adults in the United States are not consuming the

recommended five servings of fruits and vegetables. A study conducted by the Center for Disease Control and Prevention estimated the percentage of adults that met fruit and vegetable intake recommendations and showed that 12.3% and 10% of adults met fruit and vegetable recommendations, respectively (Lee et al., 2022). In Maryland, only 13.5% and 9.9% of adults were meeting the recommended servings in 2019 (Lee et al., 2022). Therefore, our investigation on the lack of fruits and vegetables consumption issue in Baltimore, could yield valuable insights applicable on a wider scale.

The low consumption of fresh fruits and vegetables in Baltimore, particularly in the low-income communities, could be partly attributed to the limited purchasing power. The Baltimore poverty rate, which is measured by the comparison of a person's or family's income to a specific poverty threshold to cover basic needs, was 19.6% in 2022, indicating limited purchasing power by the (United States Census Bureau, 2022). With limited purchasing power, maintaining a healthy diet that meets recommended servings is often difficult for residents, resulting in low consumption of fruits and vegetables, specifically (Berkowitz et al., 2023).

The inadequate consumption of fresh fruits and vegetables are associated with the lack of accessible and affordable options. In 2015, the Johns Hopkins Bloomberg School of Public Health's Center for a Livable Future (JHU CLF) partnered with the Baltimore Food Policy Initiative to develop a food environment map. This 2015 food environment map uses the developed methodology to assess the four factors of a Healthy Food Priority Area: access to a vehicle, income, distance to a supermarket, and the availability of healthy food. It showed that one in four Baltimore residents are living in priority areas that lack accessible and affordable options for fresher fruits and vegetables (Buczynski et al., 2015). Using this food environment map, results can lead to practical, evidence-based resources that can aid in creating and

expanding food access by strategizing policies that promote equitable access to affordable food by all residents of Baltimore (Buczynski et al., 2015). Insights from this JHU CLF-developed methodology, such as planning and legislation related to healthy and affordable food access, can serve as a template for identifying other communities within the United States facing similar food insecurities.

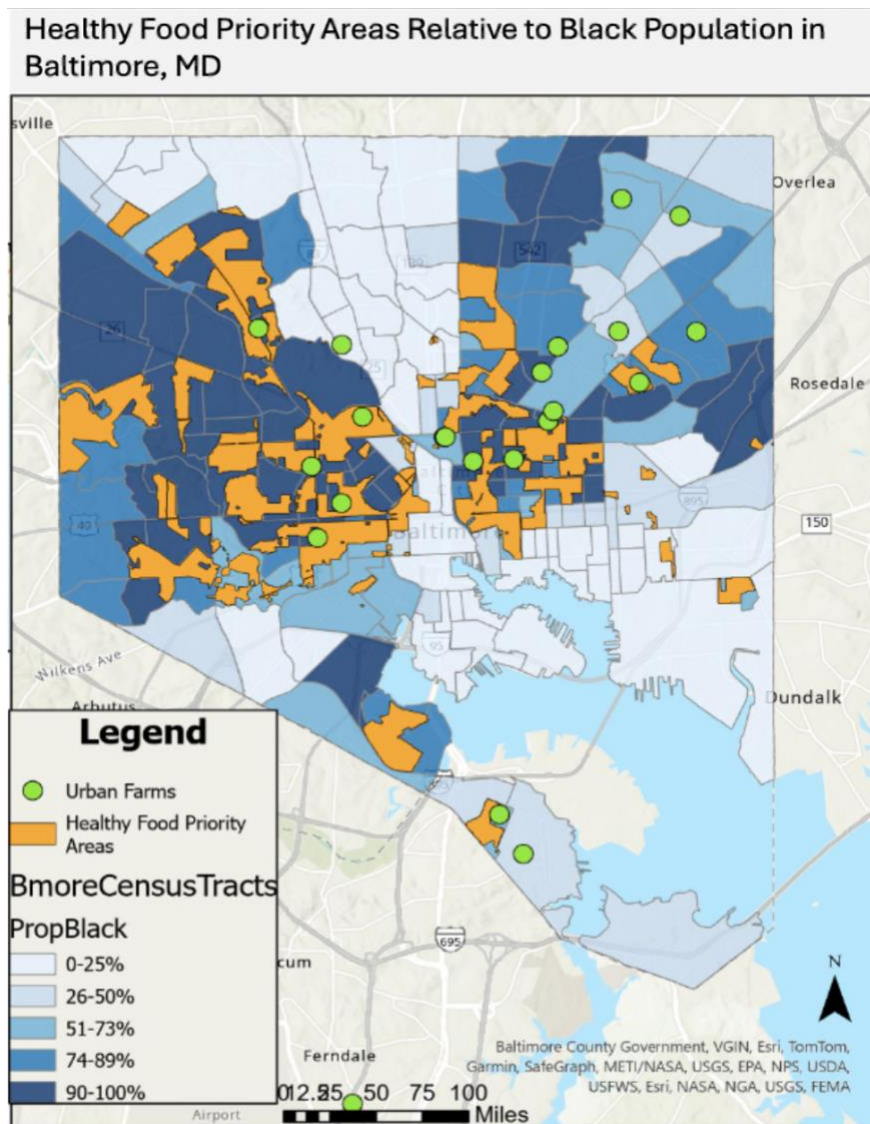


Figure 1: The spatial distribution of Healthy Food Priority Areas relative to the African American population in Baltimore, MD.

Social inequities may serve as a key factor contributing to food insecurity, as many Healthy Food Priority Areas are found in regions with a higher population of African Americans (Figure 1). With Baltimore being a predominantly African American city, many disproportionately face food insecurity and reside in what are now termed Healthy Food Priority Areas.

Urban farms in Baltimore

Urban farms that have been established in Baltimore present an opportunity to improve the accessibility and availability of fresh fruits and vegetables, particularly for low-income residents (Figure 2). For example, by improving their distribution efforts, through mobile markets or partnering with community organizations, these urban farms could play an important role in improving the accessibility and availability of fresh fruits and vegetables for low-income communities. In addition, they can also potentially provide added benefits for the environment and society through stronger community development, improved economic development, and increased social cohesion (Payne, 2020). A city agency program, Food Systems & Urban Agriculture: The Sustainability Plan, was developed by the Baltimore City Department of Planning in 2023. With this plan, a more sustainable food systems initiative incorporates policies that encourage the growth of urban farms and local food production, which will also aid in strengthening the local food system and economy of Baltimore (Baltimore City Department of Planning, 2023).

The extent to which previous studies have investigated urban farms and their ability to alleviate food insecurity varies. Some studies have delved deeply into the impact of urban farms on local food systems, examining aspects such as production yields, community engagement, and economic viability. These studies often highlight the potential for urban farms to contribute

significantly to addressing food insecurity by providing fresh produce, creating employment opportunities, and promoting sustainable practices (Steenkamp et al., 2021; Martellozzo et al., 2014). However, other studies may have only scratched the surface of this topic, offering limited insights into the effectiveness of urban farms in combating food insecurity. Factors such as the scale of the urban farm, its location, and the support it receives from policymakers and the community can also influence the outcomes studied in these research endeavors. In light of these developments, it is timely to examine how urban agriculture might address the persistent issue of food insecurity in Baltimore.

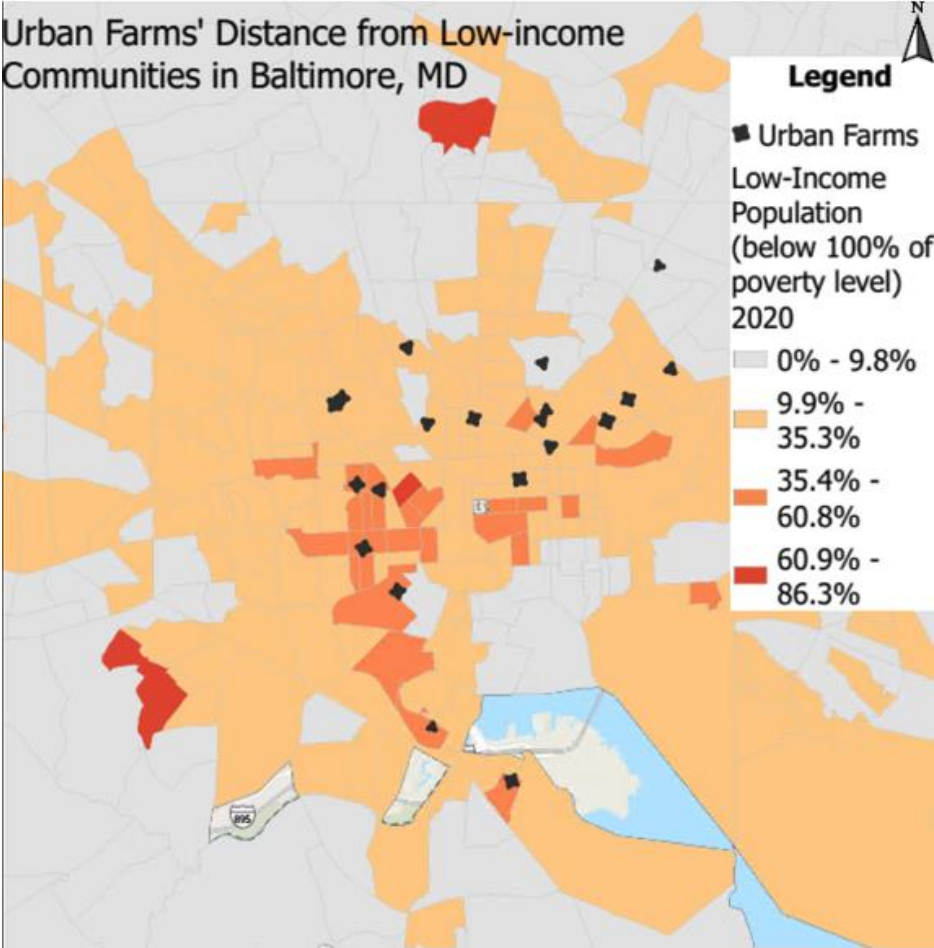


Figure 2: Map of urban farms relative to low-income population in Baltimore, MD.

Chapter 2: Urban Agriculture as an Approach to Address Food Insecurity

Introduction

Baltimore, like many cities, faces various food access challenges that can impact the well-being of its residents. Certain areas of Baltimore, particularly low-income neighborhoods, lack access to affordable and nutritious food (Brace et al., 2017). In these areas known as Healthy Food Priority Areas, residents have limited access to grocery stores and fresh produce. Instead, they may rely on convenience and corner stores or fast-food outlets, which offer unhealthy, processed foods. In Baltimore, public transportation options may be limited or unreliable, making it challenging for residents to travel to supermarkets or farmers' markets. Even when grocery stores are accessible, the cost of nutritious food can be prohibitive for many Baltimore residents. This can lead to food insecurity, where individuals and families struggle to afford an adequate and balanced diet.

Consequently, I used Baltimore as a case study and carried out interviews with urban farmers and community members in a Healthy Food Priority Area. The objective is to identify and address the gap between the production and consumption of nutritious foods, such as fruits and vegetables. By exploring how food distribution networks in Baltimore could be restructured, the study aims to identify strategies that could reduce disparities across food environments. The investigation has been guided by the following research questions:

1. What are the underlying factors that are impacting the consumption of fresh fruits and vegetables in Baltimore, MD?

2. To what extent does the establishment of urban farms have an influence on the accessibility of fresh fruits and vegetables?
3. How can the accessibility and availability of fresh fruits and vegetables be improved for food insecure communities to ensure optimal fruit and vegetable consumption?

Methods

Data Collection

This research study analyzes 14 individuals' perspectives of food insecurity, all of whom were interviewed between September 2023 and January 2024. The focus of this study were neighborhoods in East Baltimore, specifically Johnston Square and Oliver, and Frankford in Northeast Baltimore. where there are areas that are classified as a Healthy Food Priority Area, in which they have limited access to grocery stores that offer a variety of fresh fruits and vegetables. In East Baltimore, African Americans make up 42% of the population, followed by White, Hispanic, and Asians, making up 12%, 4%, and 4%, respectively (Census Bureau, 2022). The median household income in this area is \$65,734, which is nearly two-thirds of the amount in Maryland at \$94,991 (Census Bureau, 2022).

Recruitment

Once the study was approved by the University of Maryland's Institutional Review Board (Appendix B), recruitment began for the research study. To be eligible to participate in the study, participants had to be 18 years or older and possess the ability to speak English. There were two populations that were recruited for the study: urban farmers or employees of a Baltimore urban farm; and community members experiencing food insecurity, which was determined by participation at a food pantry. There were no limitations to sex, race, ethnic origin, etc.

Using a snowball sampling method (Faugier & Sargeant, 1997), food insecure community members were recruited initially through email to an urban farmer, who then contacted partnering food pantries and distribution centers. Additionally, food insecure community members were recruited at market nights held at participating urban farms. To recruit urban farmers, a variety of methods were used. First, we conducted a Google search to identify urban farms in Baltimore, gathering information about their location, size, missions, and contact information. After gathering this data and creating a spreadsheet containing this information, these urban farms were contacted via email to discuss the research study. In addition to a Google search, we contacted the Farm Alliance of Baltimore, and used a snowball sample approach. We were invited to a monthly meeting that is held by the Farm Alliance of Baltimore to discuss the research study in person and talk to other urban farmers that may be interested in participating. Using these approaches, seven food insecure community members and seven urban farmers were interviewed, for a total of fourteen interview participants. A key was used, linking personally identifiable information to the participant study ID. A random code was assigned to each participant to replace identifiable information in the data.

Interview Protocol

Interviews were conducted in-person, via Zoom, or via telephone for 30-60 minutes each. While an in-person interview was the preferred method, if an interview could not be conducted in-person and the participant was still interested in an interview, the interview was conducted via Zoom or a phone call. The interview protocol can be found in Appendix A. Community members who are experiencing food insecurity were asked about their food consumption habits, purchasing behavior and affordability, distance traveled to access food, and challenges of purchasing fresher products. They were also asked about their perspectives on how accessibility

and availability of fruits and vegetables can be improved. To identify opportunities for urban farms to increase the accessibility of fresh fruits and vegetables, urban farmers were asked about their farming practices, including supply and distribution patterns, average clientele, and accessibility of their farm products to low-income and food insecure communities. Urban farmers were also queried about their knowledge of food insecurity in the area and how they farms are currently addressing the issue.

Data Analysis

Interviews with food insecure community members and urban farmers were transcribed and thematically coded (Boules & Kato, 2023) to provide implications for the research questions, including determining the underlying factors that influence low consumption of fresh fruits and vegetables in Baltimore, how urban farms have had an influence on food access, and improving accessibility and availability of fruits and vegetables for food insecure communities. Using Atlas.ti, a qualitative research software used for coding and analyzing, codes were generated for each interview with food insecure community member in relation to the question of underlying factors that impact the consumption of fresh fruits and vegetables. Table 1 illustrates the codes that were generated from the seven interviews with community members, along with how many times the code was mentioned throughout all seven of their interviews.

Table 1. Coding Scheme of Obstacles and Solutions from Community Interviews. The frequency here denotes how many times the seven food insecure interviewees mentioned the code.

OBSTACLES	FREQUENCY	SOLUTIONS	FREQUENCY
Income	18	Food Pantries	17
Financial Constraints	17	Community Gardens	6
Access	14		

Results

Factors leading to low consumption of fruits and vegetables

The first question I investigated in this study was determining the underlying factors that affect fruit and vegetable consumption in Baltimore city. Results show that income, cultural values, and a lack of nutrition education in the school system, are the three most frequently identified barriers that prevent food insecure community members from accessing fresh fruits and vegetables on a regular basis (Table 2).

Table 2. Factors Leading to Low Consumption of Fruits and Vegetables According to Community Members.

This table shows common themes that arose from interviews with food insecure individuals and urban farmers (n = 7), regarding factors that contributed to the barriers in accessing fresh produce faced by food insecure individuals.

THEME	PHRASE	# OF RESPONDENTS
INCOME	“Sometimes have to prioritize bills over food”	4
CULTURAL VALUE	“Want more culturally significant foods”	4
SCHOOL SYSTEM	“Don’t know how nutritious it can be”	3
TRANSPORTATION	“I use my car to go get groceries”	2
CRIME	“Employees start fights with each other because they’re hungry”	1

Over half of our participants highlighted income as the biggest barrier to fresh fruit and vegetable consumption. Participants emphasized that oftentimes, they are faced with the decision of having to prioritize bills over food, leading to personal battles in choosing a roof over their head or food to eat. Furthermore, a lack of access to financial resources, such as food stamps or cash transfers, influenced their ability to purchase fresh fruits and vegetables as well. One participant stated that access to food stamps was not always granted and said,

“I tried to get \$40 worth of food stamps and they didn’t give it to me because I wasn’t eligible, even though I just lost my job after COVID.”

Two of the food insecure community members noted that supermarket produce prices were high. They used to be able to afford these prices, but now they cannot due to two factors: losing their jobs during COVID-19 and the recent increases in supermarket prices. Because of the prices supermarkets offer produce at, 42.9% of our participants stated that they now rely on food pantries for their produce. Two participants that used to shop at Walmart or Whole Foods for groceries now have to rely on food pantries and distribution centers to receive fresh fruits and vegetables because they can no longer afford them on a regular basis. Because their budgets have gotten tight at times, our participants applied for food stamps and relied on food pantries and distribution centers. One participant has even started volunteering at a food pantry to assist those that are facing a similar challenge. Two participants have utilized food pantries for support for many years, while five participants have started to rely on them more recently after COVID-19. Before utilizing food pantries and distribution centers, of the five that typically bought groceries from stores, they spent about \$65 on produce, on average. This produce included okra, strawberries, bananas, kale, lettuce, tomatoes, lemons, peaches, and other fruits and vegetables, some of which were seasonally available. For our participants that shopped at supermarkets, they mentioned shopping at Whole Foods, Safeway, and SaveALot, with the latter being the least expensive of the three. Dollar General and Family Dollar are the main stores that our community members shop at, which includes shopping for items other than groceries.

Another factor influencing the consumption is the generational/cultural value of specific foods, particularly culturally significant foods.

During the interviews, community members emphasized that convenience and corner stores are easily accessible compared to grocery stores, which are over a mile away from all their residences. However, convenience stores and corner stores offer more processed foods and

snacks and do not offer nutritional foods that are sufficient for a healthy diet. All of our participants believe that convenience and corner stores are more accessible than supermarkets, especially as they are on nearly every block. Despite the closest grocery store being over a mile away from their home, five of the food insecure participants noted that they have a personal vehicle, so transportation is not a hindrance for them.

Another factor that food insecure community members said influence their consumption of fresh fruits and vegetables is the generational/cultural value of specific foods, particularly culturally significant foods. From our sample, 57.1% of urban farmers and 57.1% of food insecure individuals stated that many of the community members grew up eating specific foods a certain way and are unaware of how to prepare some foods differently to maximize nutritional value. While their diet consists of some fruits and vegetables, half of our participants are not able to access fresh fruits and vegetables on a regular basis compared to when they were growing up. The foods they consumed growing up are difficult to find easily, which they brought up to urban farmers. Addressing this concern, urban farmers have now started growing and harvesting culturally significant foods to be inclusive of different cultures amongst community members. In addition to this, much of the produce they consumed growing up were seasonal, which was one difficulty our participants noted in our study. This affects their accessibility to fresh fruits and vegetables, especially those of specific seasonality. Similarly, with this lack of awareness comes a lack of knowledge in food preparation. With the produce they receive from food pantries, many participants were unaware of how to prepare the produce in different ways because they were only familiar with the way it was prepared during their upbringing. To increase peoples' awareness in how to cook foods multiple ways to maximize nutritional value, urban farms implemented cooking demonstrations and recipe handouts at weekly market nights. Community

members that attended the free market nights were extremely willing to learn how to prepare foods differently.

I asked the same question to urban farmers; what they perceive as the biggest underlying factors that impact the accessibility and consumption of fresh fruits and vegetables (Table 3). This was to gain an understanding on their perspective of the food insecurity issue in Baltimore and to provide insights on how they have addressed the barriers since the start of their establishment. According to the urban farmers, the underlying factors that affect low consumption of fruits and vegetables include income, generational and cultural values, the school system, a lack of knowledge around food preparation, and crime. Many of the factors that were listed by urban farmers were the same as or very similar to the responses given by community members.

Additionally, 42.9% of the food insecure individuals that were interviewed stated that school educational awareness about nutrition is very poor. Participants perceived that school lunches are unhealthy and education around nutrition is lacking from elementary schools to high schools. The lack of education in the school system in this regard may contribute to a lack of knowledge in food preparation and how nutrients can be maximized in general.

Table 3. Factors Leading to Low Consumption of Fruits and Vegetables for Community Members – Perspectives of Urban Farmers.

This table shows common themes that arose from interviews with urban farmers (n = 7), regarding factors that contributed to the barriers faced by food insecure individuals.

THEME	PHRASE	# OF RESPONDENTS
INCOME	“We have free market nights and distribute for free because people don’t have the money”	5
GENERATIONAL/ CULTURAL VALUE	“Growing more culturally significant foods”	5
TRANSPORTATION	“It’s hard to get around if you don’t have a car, most of our community members walk here”	5
EDUCATION/ LACK OF KNOWLEDGE	“They don’t know how to prepare the food once they get it”	4
SCHOOL SYSTEM	“Started programs with student volunteers to increase their knowledge about urban farming”	4
CRIME	“People get hangry and take it out on others, crime in neighborhoods goes up”	2

Impact of Urban Agriculture

Our second research question looked at how urban farms have had an influence on the accessibility and availability of fruits and vegetables. Urban farmers that I interviewed generally view urban agriculture as a method that increases access to fresh fruits and vegetables.

Particularly through donating to local food pantries, 42.9% of the urban farmers we interviewed said that community members were relying on food pantry donations more, so the increased demand has led their farm size to grow and has allowed them to produce more. Furthermore, as our urban farmers mentioned, urban agriculture involves community engagement and empowerment, and participation. Engaging residents in growing food has allowed our farmers to increase access of their products to residents by hosting market nights. As urban farms continue to grow produce, almost all of our farmer participants view urban agriculture as a way to enhance food insecurity by reducing the reliance on external food sources and promoting local

food production. Urban agriculture in Baltimore has influenced the accessibility of fresh produce via food pantries, but food insecure community members were still unaware of how exactly to locate and utilize urban farms directly. Urban farms are a source of the increased access to fresh fruits and vegetables through food pantry donations, but they have potential to foster community engagement further.

In our interviews with urban farmers, I found that many urban farmers emphasized the need for community engagement between farmers and neighbors. A Baltimore farm I interviewed initially conducted a community needs assessment, which showed that community members asked for a more robust food system in the community. One of the ways community members thought this can be addressed is the engagement of youth and other residents in the physical upkeep of neighborhoods and farms, which will facilitate community empowerment and social cohesion.

To address this, many farmers have organized weekly free market nights and meeting events, which allow the public to meet the farmers who are growing their produce. Here, community members that have limited access to fruits and vegetables are able to receive locally grown produce for free. These products include okra, pepper varieties, lettuce, kale, tomatoes, squash, and others. Through the free market nights and meeting events, community members are able to engage with farmers on a deeper level and interact with the farmers that are distributing their produce. Additionally, the free market nights hosted by the urban farms were developed with the intention of addressing the underlying factor of income, according to two farmers I spoke to. As food insecure community members view prices as expensive, urban farmers have taken this into consideration and hosted market nights twice a week, where food insecure community members can receive farm grown produce for free. Three of the food insecure community members said that these market night events have increased their access to produce because they are not able to

receive these products otherwise. They mentioned that without these market nights, they would likely not be able to get any fresh food anywhere else. Besides holding the free market nights one to two times a week, three urban farms also donate food twice monthly to the Baltimore Redevelopment Action Coalition, the Maryland Food Bank, and other food pantries.

Urban farms also address the other factors related to low consumption of fruits and vegetables in addition to income. To address the transportation barrier for community members, a few urban farms have started delivering produce to schools and senior centers as well as to homes that are within a one-mile radius of their farms, indicating an influence on improving access to fruits and vegetables. Three of the local food pantries that urban farms (from our sample) grow food for and donate to are located in front of or close to bus stops, providing easier access to the community members that are only able to travel by public transportation to receive fresh food.

Furthermore, a common theme from the urban farmer interviews involved the lack of knowledge about food preparation, which implied a need for more education for the public, especially food insecure community members. While community members sometimes obtain fresh fruits and vegetables, urban farmers felt that many were unaware of how the produce can be utilized efficiently, especially to maximize nutrient intake. As a result, a few farms now offer cooking demonstrations and recipe handouts either at weekly market nights, online, or at farmers markets. However, nearly all of our food insecure participants have not attended or purchased from bigger farmer's markets, which are different from the free market nights, due to limited awareness about the farms themselves and their respective locations, indicating the need for stronger efforts to engage urban farms' engagement with the community and increasing their accessibility to the farms. When visiting one of the farms during the market night, we saw the engagement between the farmers and community members that took the previous week's recipe home with them,

cooked, prepared, and shared their food with the farmers the following week. The majority of the attendants at the free market nights were Black, low-income residents in the community.

Improving Accessibility and Availability

Our third research question was about how the accessibility and availability of fresh fruits and vegetables can be improved further. Although urban farms have implemented a community needs assessment to cater to the community's wants and needs, food insecure community members believe that there are aspects that could be improved upon. These improvements include more community gardens and increased proximity of those community gardens to residential areas, increased education and communication, and food bank expansions.

About 85.7% of food insecure individuals mentioned that having more community gardens and opportunities for urban farming would increase their accessibility to fresh fruits and vegetables. While both urban farms and community gardens offer increased access to fruits and vegetables, they are operated differently. Community gardens assist in supplementing residents' diet with fresh fruits and vegetables, limiting the burden of food costs, but also increasing the natural space for social cohesion (Puget Sound Regional Council, 2013). Urban farms are operated on a larger scale, often growing produce for sale and require a business license for operation (Puget Sound Regional Council, 2013). However, three of the urban farms we interviewed did not sell for profit and also donated produce to local food distribution centers. Currently, not all areas have community gardens where fresh produce can be grown and distributed. Creating more gardens would improve access to food that cannot be purchased otherwise, as food distribution would occur more often during the week. One participant said that promoting community gardens and collaborating with local farmers can significantly improve access to fresh fruits and

vegetables for food insecure individuals, especially those who rely on food assistance programs like Supplemental Nutrition Assistance Program (SNAP).

As a lack of knowledge about food preparation and nutrition was prominent, a potential solution to this factor, proposed by urban farmers and community members, is to increase awareness and education through learning and communication. Better nutrition education, improved policies regarding school lunches, and implementing knowledge of food groups in the school curriculum would allow young people and adults to take better care of their health earlier on in their lives.

For food insecure individuals, we found that there has been an increased reliance on food banks/food pantries to receive foods, especially after the COVID-19 pandemic. However, community members also suggested improvements to the food banks and distribution centers. For example, not all food banks or distribution centers are open or available at convenient times for community members. When one facility is closed, an alternative may be several miles away, posing a challenge for individuals without reliable transportation or resources. Increasing the availability of these essential services, along with expanding the operational hours throughout the week, could significantly enhance access to fresh produce.

Additionally, two community members emphasized the need to support local farms that donate to food pantries, suggesting that it could streamline the supply of fresh fruits and vegetables to those that rely on these food sources.

Discussion

Our findings align with the existing literature on the importance of accessibility in the low consumption of fresh fruits and vegetables (Krølner et al., 2011; Dave et al., 2010), while also

highlighting further obstacles such as income and lack of knowledge about preparing produce. Moreover, our study unveils emerging barriers to accessing produce, including cultural values and crime. Notably, we identified school systems being a direct factor in the low consumption of fresh fruits and vegetables, adding a fresh perspective to the existing literature. Implementing nutritional education programs in school systems starting from elementary school through high school can increase student awareness about the foods they are consuming. Baltimore City Public School can potentially require nutrition education programs, which could likely influence an increased accessibility and more informed nutrition choices.

In contrast to some existing literature that highlight transportation as a pivotal issue in accessing healthy food and increasing consumption of fruits and vegetables, it was not a major concern among participants in this study. Much of the literature regarding food insecurity suggests that transportation is a key factor that reduces accessibility to adequate nutrition (Martinez et al., 2019; Jin et al., 2022). Notably, it is one of the four criteria that determines a Healthy Food Priority Area, where over 30% of households have no vehicle. Citizens that have access to a personal vehicle typically have a significantly lower risk of experiencing food insecurity compared to those that own a vehicle (Martinez et al., 2019). However, over half of the food insecure participants in this research study owned a vehicle and claimed that transportation was not one of the leading factors. We found that transportation was a barrier for only 28.6% of our participants. About 71.4% of participants had access to a personal vehicle and were able to travel to get groceries. Our sample could differ from other populations in existing literature because Johnston Square offers public transportation, making it a neighborhood that is public transit friendly. Similarly, another potential reason could be because Johnston Square is located in the heart of Baltimore, and as it is a densely populated area, people would likely require a personal

vehicle. However, this could be an area for future research. For our participants that had no access to a personal vehicle, extra fees had to be paid to get groceries delivered, which cut into their budgets for groceries and other bills, such as water and electricity. If participants were not able to pay that fee, family members and neighbors were willing to assist them. Similarly, due to the fact that they did not own a vehicle, it was very difficult to travel to get groceries. As a result, one participant had also traveled thirty minutes by bus, once a month, to buy groceries because it was challenging to transport multiple bags at one time. Furthermore, snowball sampling could be a potential reason for transportation not being a direct issue for food insecure community members, as most of the sample happened to own a vehicle.

Moreover, urban farmers and food insecure community members had differing perspectives of transportation being a main factor in the low consumption of fresh fruits and vegetables. Urban farmers' views on transportation being an issue for community members could be because it is aligned with one of the criteria for a Healthy Food Priority Area. As one indicator of a Healthy Food Priority Area is that over 30% of households do not have a vehicle, urban farmers in our sample could have made a general assumption that community members do not have a vehicle, thus posing a challenge for them to travel to obtain produce. Another potential reason for their differing perspective could be that the community members they engage with at the market nights often walk there and do not use a car. Community members did not see transportation as a major factor. In the sample area, the percent of households without vehicle access ranges from 8.8% to 15.1% (U.S. Census Bureau, 2023).

Limitations

Constrained by the time and resources available for this study, we conducted interviews with seven urban farmers and seven community members from the low-income community. Although such a sample size is generally considered appropriate for this kind of qualitative research (Hennink & Kaiser, 2022), we recognize that the limited number of participants restricts the generalizability of our findings, reduce the diversity of emerging themes and patterns, and constrain the applicability of the results to other contexts. With a small sample size, the findings may not be representative of the broader population affected by food insecurity. This limits the generalizability of the research findings and makes it challenging to draw conclusions that apply to a larger population in another region (Faber & Fonseca, 2014). Oftentimes, qualitative research involves analyzing themes, patterns, and relationships within the data to identify key insights and trends. With a small sample size, there may be limited variability in the data, resulting in fewer themes or patterns emerging from the analysis. This can constrain the depth and richness of the findings and may overlook important factors or experiences related to food insecurity. One aim of a research study is to produce findings that are transferable to similar contexts or settings. However, with a small sample size, the transferability of findings to other populations or settings may be limited. Larger sample sizes increase the likelihood of identifying common themes, experiences, and factors that can be more broadly applicable beyond the specific study participants.

Conducting interviews with food insecure community members presented significant challenges. Although we successfully engaged with and interviewed individuals in East and Northeast Baltimore, we faced difficulties in reaching participants from certain areas of Baltimore that face more acute food insecurity, such as Turner Station. To address this issue in future work, working

closely with an established food insecure community, like Turner Station, may enrich perspectives and ideas into how food accessibility can be improved.

Despite these limitations, our interviews have yielded novel insights into the obstacles impeding fruit and vegetable consumption and the role of urban agriculture. They underscore the importance of examining the link between urban farms and low-income communities and offer a preliminary example for more expansive future interviews and research endeavors. The research outcome could inform ongoing policy and program development.

Policy Implications

Addressing food insecurity requires a multifaceted approach that goes beyond emergency assistance and includes structural changes to improve food access, income security, and community resilience. As mentioned previously, the Baltimore City Department of Planning developed the Food Systems & Urban Agriculture Sustainability Plan in 2023 for a more sustainable food system. This approach has two main sections: climate and resilience regarding food systems, and community urban agriculture (Baltimore City Department of Planning, 2023). The initiative's strategies that closely align with this study are using food system priorities to identify ways to create a more equitable food system and strengthening the local food economy by increasing access to fresh fruits and vegetables to underserved communities. To measure the success of this section, the City will identify and measure the amount of food system policies developed using race and equity frameworks, track food resilience related activities, and identify the amount of procurement contracts that include "Good Food Procurement" standards. For the community urban agriculture section, there are also strategies that can be informed by this study:

ensuring farmers and gardeners can produce fresh food safely and sustainably and educating residents on opportunities to support and engage with various local urban farmers.

Our research findings offer empirical support for this initiative by Baltimore and can inform the design of programs and policies under the initiative. For example, our interview shows that community members identified a need for supporting local farms, especially those that donate to food banks and pantries, supporting growers and ensuring that farmers and gardeners have the means to produce fresh food for communities can increase accessibility and availability of fresh fruits and vegetables to food insecure communities in Baltimore. Furthermore, the findings in this study can contribute to the second strategy of the sustainability plan relating to community urban agriculture. As some participants have not utilized urban farms as a potential method to obtaining fruits and vegetables, increasing their education and awareness about the locations and benefits of urban farms can potentially allow them support and engage with local urban farmers of Baltimore.

Addressing the barrier of income in relation to food insecurity also requires a versatile approach that combines policy interventions at various levels. In addition to addressing food insecurity through policy interventions, it is crucial to focus on increasing job opportunities and addressing unemployment issues in these regions. By creating employment opportunities in sectors such as agriculture, food production, and community development, individuals and families can improve their financial stability and access to food. Initiatives such as workforce development programs, job training, and support for small businesses can play a significant role in reducing unemployment rates and empowering communities economically. Implementing and enforcing living wage policies would ensure that workers receive a wage that is sufficient to cover their basic needs, including food. This can significantly reduce the number of households struggling

with low income and food access. Furthermore, improving affordable housing policies can potentially free up more income for food purchases. Policies that promote affordable housing options, rent control, and housing subsidies can help reduce the financial burden on households, allowing them to allocate more resources to food.

Effectively tackling poverty and low income in these regions necessitates a holistic approach that recognizes the interconnectedness of job opportunities, crime rates, and racial injustice.

Unemployment and underemployment contribute significantly to financial instability, making it essential to prioritize job creation and economic empowerment initiatives. Additionally, addressing systemic issues such as racial discrimination and inequality in access to resources and opportunities is paramount to fostering inclusive and equitable communities. High crime rates can also exacerbate poverty by creating barriers to economic development and deterring investment. Implementing community policing strategies, investing in crime prevention programs, and promoting social cohesion can contribute to creating safer neighborhoods and reducing crime-related challenges that hinder economic progress. Moreover, tackling racial injustice requires dismantling discriminatory policies and practices while promoting equity and inclusivity across all sectors. This includes initiatives to increase representation and leadership opportunities for marginalized communities, address disparities in education and healthcare, and foster community engagement and dialogue to promote understanding and collaboration. By implementing these policy recommendations in a coordinated and inclusive manner, policymakers can make significant strides in reducing income-related barriers to food security and improving the overall well-being of individuals and families facing food insecurity.

Conclusions and Future Directions

This study sheds light on the variety of factors contributing to food insecurity in urban settings, with a specific focus on Baltimore. Through interviews with both food insecure community members and urban farmers, several key findings emerged, highlighting the pervasive influence of income, cultural values, education around produce, and access to fresh fruits and vegetables.

The study underscores the significant role of income as a primary barrier in accessing nutritious foods, as individuals often face the difficult choice between basic needs and purchasing fresh produce. Moreover, cultural preferences and a lack of education regarding food preparation further compound the issue, emphasizing the need for educational interventions. Urban agriculture emerges as a promising avenue for addressing food insecurity, with initiatives such as community engagement events, free market nights, and produce donations to food banks offering tangible support to vulnerable populations. Furthermore, transportation solutions, such as home deliveries and strategic locations of food distribution points, demonstrate innovative approaches to overcoming accessibility challenges.

For policy improvements in Baltimore, several recommendations can be made based on the study's findings. Firstly, there is a need for enhanced nutrition education programs in schools to empower individuals with the knowledge and skills to make healthier food choices. Additionally, expanding access to community gardens and increasing the availability of fresh produce through food banks and pantries can help support Healthy Food Priority Areas and improve food accessibility.

Beyond Baltimore, policymakers should consider the broader implications of these findings for urban areas facing similar challenges. By addressing the underlying social, economic, and

educational factors contributing to food insecurity, cities can work towards building more resilient and equitable food systems, ensuring that all residents have adequate access to nutritious foods that are essential for their health and well-being.

Future directions for research on food insecurity in an urban setting like Baltimore include various areas of investigation and exploration: community-based approaches like food cooperatives and assessing the role of mobile apps for food assistance. Furthermore, an area of investigation could also be examining the impact of climate change on food insecurity and in urban areas and identifying strategies for building resilience, such as urban farming practices, climate-smart agriculture, and food waste reduction efforts. By focusing on these future directions for research, scholars, policymakers, and practitioners can contribute to a deeper understanding of food insecurity in urban settings, identify effective strategies for addressing the issue, and work towards building more equitable and resilient food systems for all residents.

Appendices

Appendix A

Community background questions:

1. How long have you lived in Baltimore?
2. What does healthy eating mean for you?
3. What does your average grocery list consist of? Based on your previous answer, what percentage of the list would you say is considered healthy?
4. How many times a month do you visit the supermarket? How often do you buy fruits and vegetables?

RQ1–literature based, hypothesized that accessibility and availability are major factors influencing consumption

1. Where do you typically purchase your food from?
 - a. How close are these places to your residence?
 - b. How often do you go to this market* and purchase food?
2. Are convenience stores more accessible than supermarkets? Are supermarkets easily accessible?
3. How difficult is it to travel to the closest supermarket?
4. Is transportation a challenge for obtaining groceries, such as fruits and vegetables, from supermarkets?
5. How far do you normally travel to buy groceries? (How long does it take you to reach?)
 - a. What is your community's proximity and access to food?
 - b. What, if anything, hinders you from purchasing fresh fruits and vegetables?

RQ2–community

6. To what degree does your community's food culture emphasize locally grown fresh fruits and vegetables? (i.e. urban farms)
7. On average, how much do you typically spend on groceries every month?
8. Has your budget for food ever gotten tight? What did you do in this case?
9. Who in the household is responsible for getting groceries and planning meals?
 - a. Who pays for the groceries?

10. Many lack access to fresh fruits and vegetables in the Baltimore area. Are there any foods that you would purchase more of if they were more accessible? If so, what are some of these foods?
11. What kinds of stores do you shop at (drug store, dollar stores, farmer's market, etc.)?
12. Have you purchased products from urban farms in Baltimore?
 - a. If so, can you describe what the process was like? How easily available was it to purchase?
 - i. What method of payment did you use?
 - b. If not, what are some challenges associated with purchasing from urban farms?
13. How do you think these challenges can be addressed?
14. What can be changed to improve the accessibility of fresh fruits and vegetables for low-income communities?

RQ3–Urban farmers:

1. How long has your farm been in business?
2. Since the farm was started, how has your customer base expanded? By how much?
 - a. How much has it grown in the last 10-15 years?
3. What kinds of products do you grow and sell?
4. Can you describe your average customer?
 - a. Are any of your customers of low-income backgrounds?
5. Are there products that could be grown or sold more to increase availability to low-income communities?
6. Would you consider your farm to be easily accessible by low-income communities? What limits your farm and its product's accessibility?
 - a. What do you feel like needs to be done to better enable low-income communities to access your farm's products?
 - i. How would you do so?
7. What do you think are the barriers of low-income communities purchasing fresh fruits and vegetables?
 - a. How can these barriers be overcome?
 - b. Is there any way you can help address these barriers?

Appendix B



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DATE: August 3, 2023

TO: Meghna Mathews
FROM: University of Maryland College Park (UMCP) IRB

PROJECT TITLE: [2066309-1] The Role of Urban Agriculture in Baltimore Food Systems

SUBMISSION TYPE: New Project

ACTION: APPROVED
APPROVAL DATE: August 3, 2023

REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category #7.

Thank you for your submission of New Project materials for this project. The University of Maryland College Park (UMCP) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

Prior to final approval of this project scientific review was completed by the IRB Member reviewer.

This submission has received Expedited Review based on the applicable federal regulations.

This project has been determined to be a MINIMAL RISK project.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Unless a consent waiver or alteration has been approved, Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate Amendment forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others (UPIRSOs) and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed. All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

Please note that all research records must be retained for a minimum of seven years after the completion of the project.

If you have any questions, please contact the IRB Office at 301-405-4212 or irb@umd.edu. Please include your project title and reference number in all correspondence with this committee.

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